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IS 10190 (1982): Test chart for copying lathes with horizontal spindle-lathes with swing over bed upto 500 mm and distance between centres up to 1500 mm [PGD 3: Machine Tools]

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IS : 10190 - 1982

(Reaffirmed 2005)

Indian Standard

TEST CHART FOR COPYING LATHES WITH HORIZONTAL SPINDLE-LATHES WITH SWING OVER BED UP TO 500 mm AND DISTANCE BETWEEN CENTRES UP TO 1 500 mm

Machine Tools, Machine Tool Elements and Woodworking Machines Sectional Committee, EDC 11; Panel for Copying Lathes, EDC 11/P-21 [Ref : Doc : EDC 11 (3348)]

1. Scope — Describes both geometrical and practical tests on copying lathes with horizontal spindle, having swing over bed up to 500 mm, distance between centres up to 1 500 mm and the corresponding permissible deviations, in accordance with IS : 2063-1962 'Code for testing machine tools'.

1.1 It deals only with the verification of accuracy and applies neither to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc) nor to the machine characteristics (speeds, feeds, etc) which shall generally be checked before testing the accuracy.

2. Preliminary Remarks

2.1 To apply these tests, reference shall be made to IS : 2063-1962 especially for installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

2.2 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine and does not define the practical order of testing. In order to make checking or mounting of instruments easier, tests may be carried out in any convenient sequence.

2.3 When inspecting a machine, it is necessary to carry out all the tests described in this standard, except for the tests which may be omitted in mutual agreement between the buyer and the manufacturer.

2.4 Practical tests shall be made only with finishing cuts, for instance, cut having a depth of 0·5 mm, feed of 0·1 mm per revolution and not with roughing cuts which are liable to generate appreciable cutting forces. However, the material of the test piece and the actual cutting conditions shall be determined by the manufacturer.

2.5 When establishing the tolerance for a measuring range different from that indicated in this standard (*see* **2.3.1.1** of IS : 2063-1962), it shall be taken into consideration that the minimum tolerance is 0·005 mm. For any proportional value, the calculated value shall be rounded off to the nearest 0·002 mm. However, the least count of all measuring instruments need not be finer than 0·002 mm.

2.6 Whenever alternate methods of testing are suggested, the choice of actual method of testing is left to the manufacturer.

2.7 For the purpose of this standard, various methods of expressing permissible deviation are employed, each having a particular type of application. The methods employed are as follows:

000/000 for deviations of perpendicularity which are ratios.

000 for any length of 000 for deviations of straightness and parallelism; this expression is used in fact for local permissible deviations, the measuring length being obligatory.

000 for 000 for deviations of straightness and parallelism; this expression is used to recommend a measuring length but in this case the proportionality rule comes into operation if the measuring length differs from those indicated.

3. Testing Instruments — The testing instruments shall be of the approved type and shall be calibrated at a recognized temperature conforming to the relevant Indian Standards.

4. Accuracy Requirements — The tests to be carried out, the instruments required, the maximum permissible deviations and the manner of carrying out the tests shall be as detailed in the test chart.

Adopted 26 May 1982

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INDIAN STANDARDS INSTITUTION
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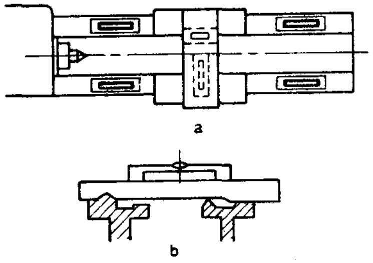
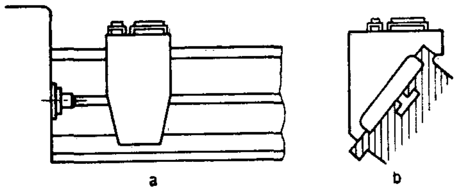
NEW DELHI 110002

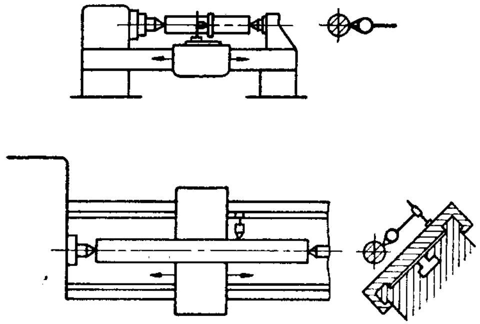
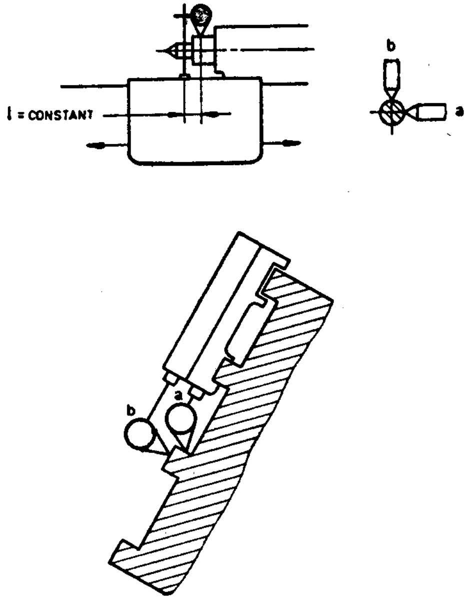
TEST CHART FOR COPYING LATHES WITH HORIZONTAL SPINDLE
LATHES WITH SWING OVER BED UP TO 500 mm AND DISTANCE BETWEEN CENTRES UP TO 1 500 mm

Type...................... Order No. .... Customer...

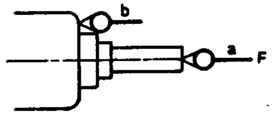
Machine No. .... Date............................. Inspector.......................................

Sl No.	I GEOMETRICAL TEST All dimensions in millimetres.					
	Figure	Object	Measuring Instruments	Reference to IS : 2063-1962 and/or Instructions for Testing	Permissible Deviations	Actual error
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		A - BED				
1	 	Straightness of carriage Slideways: a) *In longitudinal direction:* Straightness of slideways in vertical plane or in a plane perpendicular to the plane defined by the axis of centres and tool point (main working plane) b) *In transverse direction*	Precision levels, optical or other instruments	**3.3.1** and **5.1.1.2** Measurements should be made at positions equally distributed throughout the length of the bed. The levels may be placed on the transverse slide	a) *DC** ⩽ 500 0·01 (convex) 500 < *DC** ⩽ 1 000 0·02 (convex) local tolerance 0·007 5 (*see* Appendix A) for any length of 250 1 000 < *DC** ⩽ 1 500 0·025 (convex) Local tolerance 0·015 (*see* Appendix A) for any length of 500 b) 0·04/1 000	

B — CARRIAGE

2		Parallelism of carriage movement in a horizontal plane or in a plane defined by the axis of centres and tool point (main working plane) to axis of centres	Dial gauge, test mandrel or straight edges	**5.1.3.2** (a) or **5.1.3.2** (c) **1**	$DC^{*} \leqslant 500$ 0·015 $500 < DC^{*} \leqslant 1\,000$ 0·020 $1\,000 < DC^{*} \leqslant 1\,500$ 0·025 (length of the mandrel shall be as close as possible to the value of DC^{*})	
3		Parallelism of tailstock movement to the carriage movement: a) In horizontal plane or in a plane defined by the axis of centres and tool point (Main working plane) b) In a plane perpendicular to (a) above	Dial gauge	**5.3.2.2** (d) Readings are noted at regular intervals when the carriage is moved. Alternatively, the tailstock guideways may be indicated in the two planes	For both (a) and (b) 0·03 with 0·02 for any length of 500	

C — HEADSTOCK SPINDLE

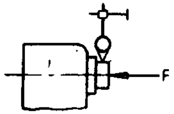
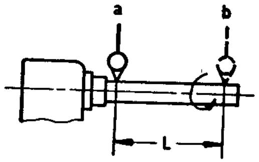
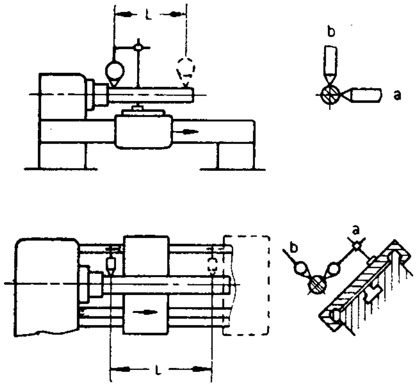
4		a) Axial slip of headstock spindle b) Camming of the face plate mounting surface	Dial gauge and, possibly, a special device for application of force	**5.5.2**, **5.5.2.1** (b) **5.5.2.2** and **5.5.3** *F* is the constant axial force on the spindle to eliminate axial bearing end play. If this is required, then its value to be specified by the manufacturer	a) 0·01 b) 0·02 including periodic axial slip	

$^{*}DC$ = Distance between centres.

(*Continued*)

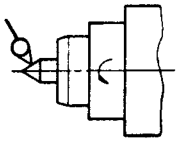
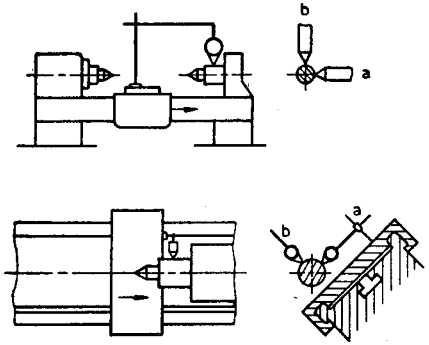
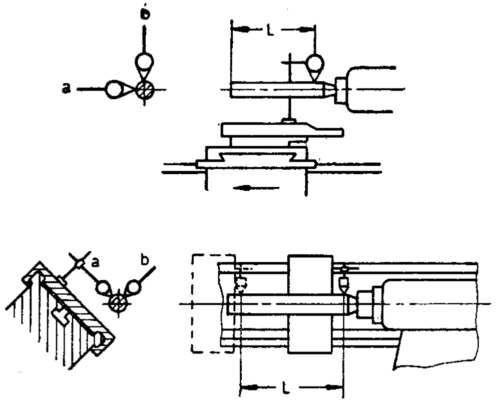
I GEOMETRICAL TESTS — *Contd*

All dimensions in millimetres.

Sl No. (1)	Figure (2)	Object (3)	Measuring Instruments (4)	Reference to IS : 2063-1962 and/or Instructions for Testing (5)	Permissible Deviations (6)	Actual Error (7)
5		True running of locating surface	Dial gauge and test mandrel	**5.5.1.2** and **5.5.2** If force *F* is required, its value shall be specified by the manufacturer. For conical spindle noses, the dial gauge shall be placed perpendicular to the generator of the cone	0·01	
6		True running of taper bore or taper socket in spindle: a) Near to the spindle nose b) At a distance *L* (*L* = *Da** / 2 or *Max* 300)	Dial gauge and test mandrel	**5.5.1.2** (b) and **A-1.1** (b)	a) 0·01 b) 0·02	
7		Parallelism of spindle axis to carriage movement: a) In horizontal plane or in the main working plane b) In a plane perpendicular to (a) *L*=*Da**/2 or *Max* 300	Dial gauge and test mandrel	**5.3.1.2**	a) 0·015/300 (free end of the mandrel inclined towards the tool only) b) 0·02/300 (free end of the mandrel inclined upwards only)	

**Da* = Maximum permissible diameter above bed (swing).

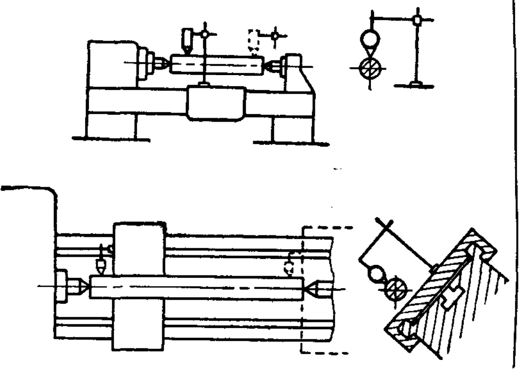
D — TAIL STOCK

8		Checking the run out of the axis of the taper bore of the tailstock	Dial gauge	**5.5.1.2** (b) and **A-1.1** (b)	0·01	
9		Parallelism of external surface of tailstock sleeve to carriage movement: a) In horizontal plane or in a plane defined by axis of centres and tool point (main working plane) b) In a plane perpendicular to (a) above	Dial gauge	**5.3.2.2** (b) After the tailstock sleeve has been sufficiently extended, tailstock and sleeve should be locked as under normal working conditions	a) 0·015/100 (free end of the sleeve inclined towards the tool only) b) 0·02/100 (free end of the sleeve inclined upwards only)	
10	 *L* = *Da*/2 or *Max* 300	Parallelism of taper bore of tailstock sleeve to the carriage movement a) In horizontal plane or in a plane defined by the axis of centres and tool point (main working plain) b) In a plane perpendicular to (a) above	Dial gauge and test mandrel	**5.3.2.2** (b) The tailstock sleeve shall be locked as under normal working conditions	a) 0·03/300 (free end of the mandrel inclined towards the tool only) b) 0·03/300 (free end of the mandrel inclined upwards only)	

(*Continued*)

I GEOMETRICAL TESTS — *Contd*

All dimensions in millimetres.

Sl No.	Figure	Object	Measuring Instructions	Reference to IS : 2063-1962 and/or Instructions for Testing	Permissible Deviations	Actual Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)
11		Difference in height between headstock and tailstock centres *or* Offset between the headstock and tailstock centre, in a plane perpendicular to the plane defined by axis of centres and tool point (main working plane)	Dial gauge and test mandrel; length of mandrel as close as possible to distance between centres or a maximum of 1 000	**5.3.2.2**(b) and **A-1.1** Dial gauge plunger brought in contact with the top generatrix of the mandrel. Readings taken at the extremities of the test mandrel with the tailstock and tailstock sleeve locked as under normal working conditions	0·025 Tailstock centre higher than headstock centre	

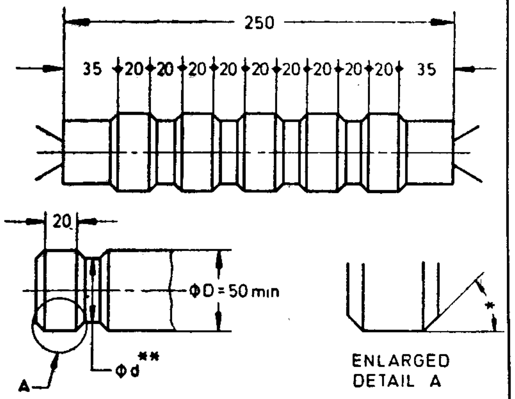
TEST CHART FOR COPYING LATHES WITH HORIZONTAL SPINDLE LATHES WITH SWING OVER BED UP TO 500 mm AND DISTANCE BETWEEN CENTRES UP TO 1 500 mm

Type......................... Order..................... Customer........................

Machine No............... Date......................... Inspector.........................

II PRACTICAL TEST

All dimensions in millimetres.

Sl No. (1)	Figure (2)	Nature of Test (3)	Measuring Instruments (4)	Reference to IS : 2063-1962 and/or Instructions for Testing (5)	Permissible Deviations (6)	Actual Error (7)
1	 250 35 20 20 20 20 20 20 20 20 20 35 20 ΦD = 50 min Φd** A * ENLARGED DETAIL A *Chamfer at 45° or 30° optional. **Shall be 1 to 2 less than *D*.	Working accuracy of machine. Turning a series of diameters *D* separated by grooves of diameters *d* with the help of a master in which the error between diameters *D* and *d* does not exceed ± 0·002		3.1, 4.1 and 4.2	The variation of diametral step differences on work piece from the corresponding values on master shall be as agreed to between the manufacturer and the user	

APPENDIX A

[*Geometrical Test No.* 1 (a)]

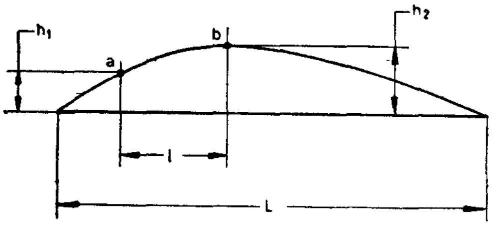
COMMENTS RELATING TO THE SLIDEWAY

A-1. Definition of the Term ' Convex Slideway ' — A slideway is considered to be convex when all its points are located above a straight line joining its extremities.

A-2. Definition of the Term ' Local Deviation from Straightness ' — The local deviation from straightness between two points of a slideway, which are separated by a specified length, which is small in comparison with the length of the slideway, is the difference between the vertical ordinates of these points.

Example:

Local deviation between points *a* and *b* over a specified length 'l' = $h_2 - h_1$.



A-3. Case of Slideways with a Regular Convex Curve — The specifications concerning local tolerance are given only to eliminate in case of linear slideways, the possibility of too large deviations in straightness concentrated on a small length [**2.3.2.2** (d) of IS : 2063-1962].

However, in the case of slideways with a regular convex which is approximately symmetrical with respect to the middle of their length, the specifications for local tolerance are too restrictive at the extremities of the slideway. In such cases the specifications for local tolerance may be doubled for the outer quarters of the slideway.

EXPLANATORY NOTE

This standard has been formulated generally in line with ISO : 1708-1979 ' Test condition for general purpose parallel lathes — Testing of the accuracy ', issued by International Organization for Standardization (ISO) and based on experiences gained by our industries over so many years.

This standard shall be reviewed to effect necessary modifications, particularly with respect to ' Practical test — Permissible deviation value ', as soon as the ISO standard on this subject is published.

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